

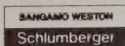
REPAIR INSTRUCTIONS

for

WESTON MODEL 749 CLAMP VOLT-AMMETER

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a Division of Sangamo Weston, Inc.
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The Measurement People™

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INTRODUCTION

GENERAL: The Weston Model 749 AC clamp Volt-Ammeter is a modernly designed and engineered instrument. This small, compact Volt-Ammeter has 6 current and 3 voltage ranges, all using a single arc scale for ease in readability.

The electrical circuit is designed to insure long life and dependability by using a printed circuit and precision components.

Basically, the instrument is a split core current transformer with a trigger operated core opening. The secondary current, from the transformer, is rectified and measured by a direct current, core magnet type movement. Voltage measurements are made by connecting leads to a voltage source which then applies the voltage to a rectifier network through suitable series resistance.

Only qualified personnel should attempt repair work since exact values of resistors are important in this instrument.

MAINTENANCE AND REPAIR OF INSTRUMENT

GENERAL: The instructions contained herein are only for certain phases of the repair and overhaul of the Clamp Volt-Ammeter. Since a small portion of the work requires very elaborate equipment, we do not feel it advisable that it be attempted by repair stations.

If replacement of the tongs is required, it is recommended that the instrument be returned to the factory for repair.

The following replacements and repairs can easily be done in the field: replacing broken or worn parts, resistors, complete resistor decks, moving coil, springs, pointer, rectifier, etc.

To keep assembly and adjustment time to a minimum, pre-adjusted resistors are used on the decks, in conjunction with printed circuitry. All resistor decks contain eleven resistors; eight of these are common for all "B" decks, a different combination of eight are common for all "C" decks, etc. Resistors

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R-1, R-2 and R-8 (see wiring diagram) can vary from one instrument to another, and are selected at the time of adjustment. In the event that any of the resistors other than R-1, R-2 and R-8 must be replaced, it is a simple matter to replace the deck without recalibrating the instrument. The location of each resistor is stamped on the deck, with numbers which correspond to the numbers given to the resistors on the wiring diagram. The values of all the resistors are given in the parts list at the end of this manual.

A code numbering system has been established to facilitate the identification of resistor decks, scales, and resistors. The code number consists of either four or five digits which appear on the inside of the case. In a four digit number the first digit on the left identifies the scale and resistor deck used. The second digit will identify resistor R-1, the third digit will identify resistor R-2, and the fourth will identify resistor R-8. The only difference between a five digit code number and one containing four digits is that the first two digits on the left identify the scale and resistor deck. The remaining three digits identify the same resistors as in the four digit number. For example: Code No. 7523 indicates - scale and resistor deck per code no. 7, R-1 per code no. 5, R-2 per code no. 2, and R-8 per code no. 3. Code No. 12413 indicates - scale and resistor deck per code no. 12, R-1 per code no. 4, R-2 per code no. 1 and R-8 per code no. 3. For correlation between code numbers and the resistors and scales which they represent refer to the parts list at the end of this manual.

The scale used in the instrument will vary with both the mechanism and tong characteristics. Scales are selected according to which deck is used in the instrument; scales B, B₁ and B₂ are used with so called B and D decks, and scales C, C₁ and C₂ are used with C decks. While the scales without the subscript (B and C) are considered as main scales, all scales have the same calibration for top mark. The scales differ in that the intermediate scale markings on those having the subscript 1

are calibrated slightly lower, and those having the subscript 2 are calibrated slightly higher.

DISASSEMBLY

During disassembly, keep the instrument in a face down position until the switch deck assembly (TB-1), scale (N-1), and mechanism (M-1) have been removed. This precaution must be observed since the mechanism is not fastened to the case. Unless this precaution is followed the mechanism may pull loose just enough to bend the pointer. If the leads have already been unsoldered, the mechanism could pull loose completely causing extensive damage.

CASE AND SWITCH DECK ASSEMBLY DISASSEMBLY:

(See figure 3)

1. Remove the base assembly (A-2) by first scraping out the sealing wax from the upper recess then removing the hex head screw and the two hex nuts from the other two recesses. Hold the instrument a little above eye level so that the pointer can be observed while the base assembly is being lifted off the studs. Any slight upward movement of the pointer indicates that the mechanism is sticking to the base assembly. Before proceeding, tap the base assembly to release the mechanism.

2. The switch deck assembly is removed by lifting the deck off its mounting studs (H-10) and unsoldering the three leads. The switch arm (E-3) can now be detached from the deck by removing the fiber lock nut (H-2).

3. The window (A-3) and scale are removed by: loosening the switch deck mounting studs approximately one half turn, putting a knife blade between the window and the cover, prying the window away from the cover, loosening the studs further, and sliding the window and scale out from the instrument.

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MECHANISM REMOVAL. (See figure 3)

The mechanism is easily removed from the instrument, after the scale and window have been removed, by unsoldering the two leads and lifting it out of the instrument.

MECHANISM DISASSEMBLY.

It is seldom necessary to disassemble the mechanism, however there are times when it may be found necessary to do so. In that case follow standard disassembly procedure. The jewels used in this mechanism are of the spring back type therefore particular attention should be paid to the descriptions on final jewel adjustment and pivot replacement under the reassembly section.

REMOVAL OF THE RECTIFIER BRIDGE ASSEMBLY.

(See figure 3)

1. To remove the resistor mounting strip (TB-2), which is part of the rectifier bridge, unsolder the leads and remove the hex nut (H-4) holding the strip to the tongs. The strip can now be lifted off the stud and the resistors (R-B) unsoldered.

2. The rectifier (CR-1) can now be removed from the instrument by unsoldering the rectifier lead on the transformer coil (L-1) and removing the screw holding the rectifier to the case.

TRIGGER AND TRANSFORMER COIL REMOVAL. (See figure 3)

1. Lifting the spring (O-3) off the trigger spring stud (H-11) releases the pressure on the trigger (O-4) which can then be removed from the instrument.

2. In order to remove the transformer coil it is necessary to remove the trigger tong (E-13) by taking off the lock nut (H-2), then remove the fixed tong (E-14) by taking off the hex nut (H-4). The coil can then be slipped off the tong.

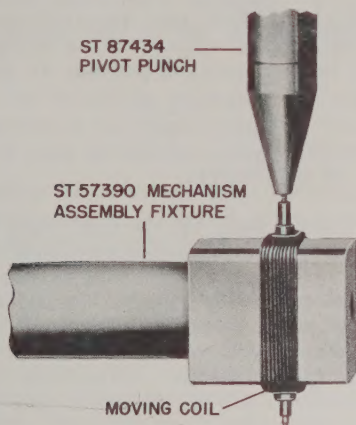


Figure 1. Pivot Replacement

REASSEMBLY. Reassembly is the reverse of disassembly except as follows:

SWITCH ARM REPLACEMENT.

When the switch arm is replaced it must be set to a torque of 3.5 to 5 inch ounces. The torque should be set by tightening or loosening the lock nut.

Do not bend the contact arm for any reason as this will affect the pressure, which is set at the factory.

PIVOT REPLACEMENT. (See figure 1)

When replacing the pivots mount the moving coil on the arbor of fixture ST-57390. Put the pivot into the small hole at

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the end of the pivot punch ST-87434 with the pointed end first. Push the shank of the pivot into the pivot base mounted on the moving coil. The pivot should extend out of pivot nut a distance of 0.032 ± 0.001 inch, in order to prevent the pivot from popping out of the jewel.

FINAL JEWEL ADJUSTMENT.

1. It is recommended, for the final jewel adjustment, that a method of vibrating the mechanism be devised. A simple arrangement, utilizing an ordinary household buzzer, will serve the purpose satisfactorily. The vibrator is put into operation and the mechanism is held or mounted on the top of the vibrator while the jewel is adjusted. The jewel is turned in until there is no visible vibration of the pointer. When this point is reached the jewel is backed off $1/8$ to $1/4$ turn to give the correct jewel setting.

2. An alternate method of adjusting the jewel may be used if no means of vibrating the mechanism is available. Tapping the top bridge with a small screwdriver, when the jewel is loose, will produce noticeable movement of the pointer. By alternately tapping the mechanism and tightening the jewel screw a point will be reached where no movement of the pointer will be noticed. When this point is reached the jewel is backed off approximately $3/16$ of a turn to give the correct jewel setting.

BALANCING THE MOVING ELEMENT.

1. In order to simplify the balancing procedure it is suggested that the mechanism be balanced, as closely as possible, before placing it in the instrument.

2. Since the mechanism cannot be readily removed and replaced with the scale in place, the final balancing will be simplified if the scale is not used until the balance is given a final check.

3. A small piece of masking tape applied to either surface of the window will serve as a reference in place of the scale marking. Line up the edge of the pointer with the edge of the tape.

4. During the balancing procedure use the back cover to hold the mechanism in its proper position. This will eliminate the possibility of error caused by movement of the mechanism.

5. The pointer shall not deviate any more than the width of a major scale marking from the initial position. This will have to be checked with the scale in the instrument.

WINDOW.

Clean the instrument with a soft cloth dampened with water. Never use cleaning solvents. If a static condition on the plastic window affects the pointer, Weston Statnul® anti-static solution should be applied. When Statnul® is not available an application of a mild laundry detergent solution may be effective.

TONG REPLACEMENT.

The tongs must be replaced in the instrument carefully. The lock nut should be tightened a sufficient amount so that there will be no side play of the trigger tong and that the tong will snap shut without binding.

For accurate current readings, jaws must close without an air gap.

GREASING.

Grease all joints and rubbing surfaces with the exception of the switch contacts. The lubricant used on the switch contacts is No Noise which is used extensively in radio and television to lubricate and quiet volume controls and channel selector switches. This is obtainable at most radio supply stores. Should the jaws require cleaning, clamp a very fine grade of sandpaper between the jaws and pull through. A light film of oil should then be applied to the jaw surfaces.

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TRANSFORMER COIL ASSEMBLY.

The transformer coil is mounted on the fixed tong and held in place by shims. After the coil has been shimmed, a 2600 volt, 60 hertz dielectric test should be made between the tong and terminals on the coil to insure no breakdown between the electrical circuit and the tong. This test is very important, since the shims must provide sufficient insulation between the inner lead on the coil and the tong. The shims are positioned so that they protrude slightly at the point where the beginning wire comes out of the coil.

CEMENTING AND SEALING.

(See Figure 3)

The two hex nuts (H-4), which hold the fixed tong in place, should be cemented with a suitable cement. After the case has been assembled, the two hex nuts are cemented and the upper case to base screw is covered with sealing wax. The sealing wax is required, to insulate the screw since the screw is electrically connected to the tongs by the trigger spring.

ELECTRICAL ADJUSTMENT AND TESTS.

Using the same scale and resistors supplied or similar ones, if necessary, the instrument is adjusted.

The adjustment procedure consists of treating the fully charged mechanism, as illustrated in figure 2, to make the 6 ampere range track on its scale. The 150 ampere range is then checked, and if necessary R-2 is selected from the group given in the parts list to make the 150 ampere range track on the scale. The 300 ampere range is then checked, and if necessary R-8 is selected to produce the proper deflection. It is sometimes necessary to go back and reselect using the more exact values of resistors obtained. The 150 volt range is then checked and if necessary R-1 is selected to make the 150 volt range track on the scale.

All tests and adjustments should be made using a 60 hertz sine wave source with a harmonic content of less than 3%. The test conductor should form at least a 12 inch rectangle, and should be located within the jaws, approximately one third the distance from the pointed end of the jaws. The temperature at which any tests or adjustments should be made is $70^{\circ}\text{F} \pm 10\%$.

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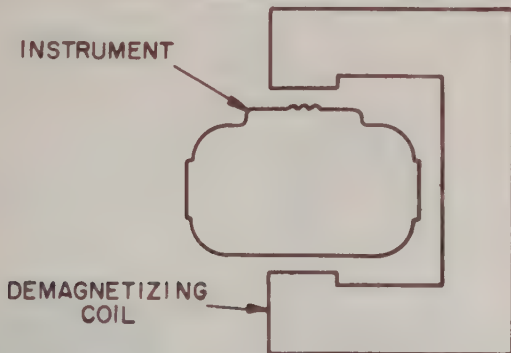


Figure 2. Treating the Mechanism

The completed instrument is given a dielectric test of 2600 volts, 60 hertz, between the voltage circuit and the tongs and between the voltage circuit and tongs tied together, and all other exposed metal parts.

PROTECTION.

This instrument and its voltage test lead have been designed for use on voltages up to 750 volts. For your protection, do not use on circuits having higher voltages. When using the M-9886 adapter for low current measurements, circuit voltages are limited to 250 volts.

Always keep the voltage test lead receptacle clean. Metallic pieces and any accumulated dirt could cause a dangerous flash-over. If jaw insulation becomes damaged, replace with new insulation. This insulation prevents shorting to other conductors when working in tight spaces. Replace the voltage test lead assembly at the first sign of insulation damage or cracking.

INSTRUMENT CONSTANTS.

The DC sensitivity is .342 to .412 ma untreated. The moving coil resistance is 68 ohms $\pm 15\%$ and the transformer coil resistance is 415 ohms $\pm 15\%$.

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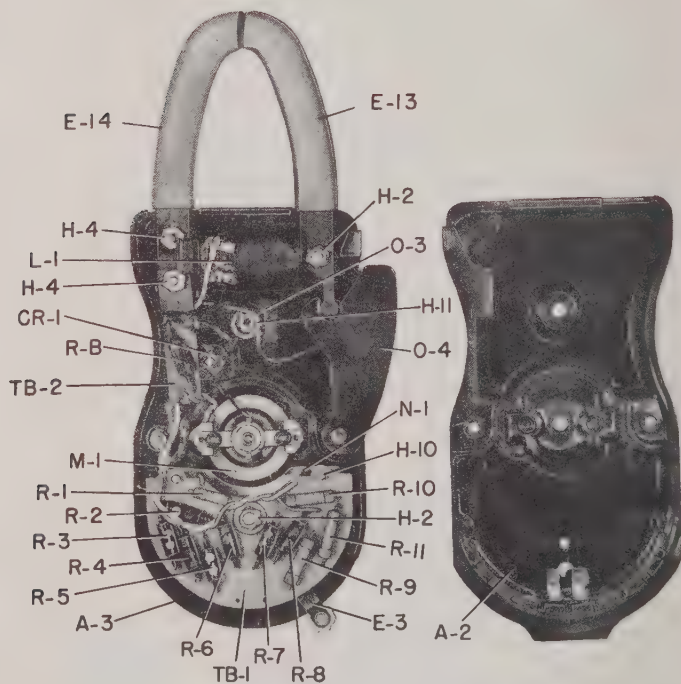


Figure 3. Internal View

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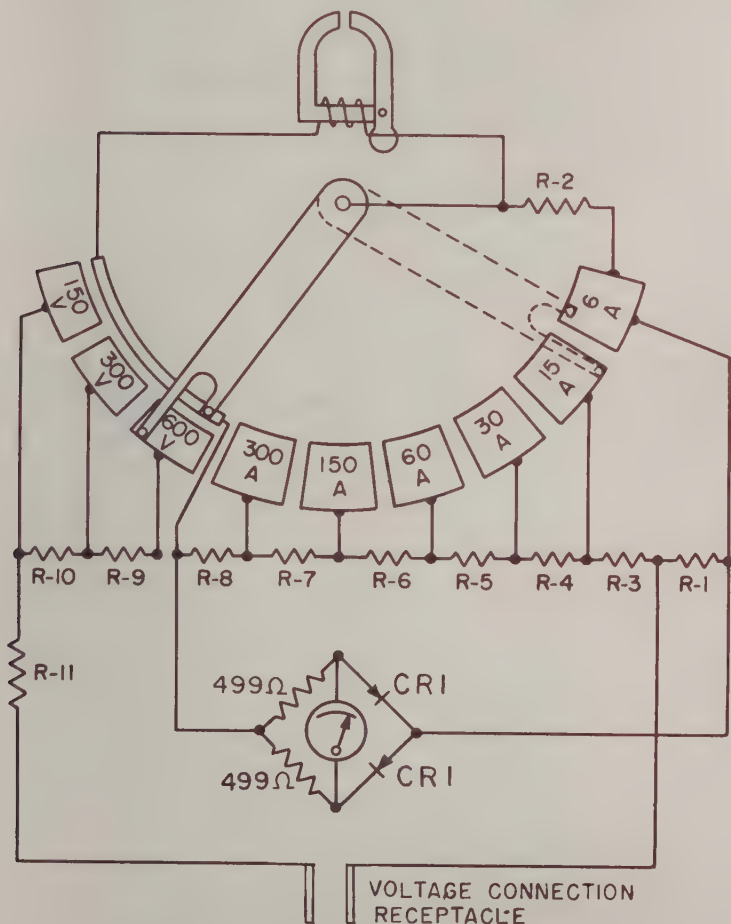


Figure 4. Wiring Diagram

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REPLACEMENT PARTS LIST FOR MODEL 749 CLAMP VOLT-AMMETER

Circuit Symbol	Code No.	Description	Weston Part No.	Quantity Per Inst.
A-2		Base, Assembly	150158	1
A-1		Cover, Assembly	150151	1
A-3		Window Scale	150177	1
E-1		Arm, Contact	150183	1
E-2		Arm, Index	150181	1
E-3		Arm, Switch	150180	1
E-4		Bridge, Assembly, Top	195461-903	1
E-5		Bridge, Assembly, Bottom	195461-904	1
E-6		Element, Assembly, Moving	150193	1
E-7		Insulator, Tong	150169	2
E-8		Knob, Switch	150179	1
E-9		Pointer, Assembly	150195	1
E-10		Screw, Jewel	150741	2
E-11		Springs, Top: 12.5 total test	152461	1
E-12		Spring, Bot.: 16 total test	152462	1
E-13		Tong, Assembly, Trigger	150163	1
E-14		Tong, Assembly, Fixed	150172	1
H-1		Cushion, Mounting Mechanism	150197	4
H-2		Nut, Hex: lock; brass; No. 5-40 thd x 0.109 in. thick	ND27900	1
2		Nut, Hex: brass; nickel pl; No. 5-40 thd x 0.110 thick x 0.87 in. wide	331	2
H-4		Nut, Hex: iron; cadmium pl; No. 5-40 thd x 0.094 in. thick	ND21523	4
H-5		Screw, Machine: brass; hex hd; No. 5-40 thd x 0.530 in. lg	154312	1
H-6		Screw, drive: rd hd; steel; nickel pl; No. 2-0.187 in. lg	ND20241	1
H-7		Screw, Machine: brass; hex hd; No. 4-40 thd x 0.375 in. lg	ND28097	1

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REPLACEMENT PARTS LIST FOR MODEL 749 (Con't)

Circuit Symbol	Code No.	Description	Weston Part No.	Quantity Per Inst.
H-8		Screw, self tapping; steel; rd hd; nickel pl; No. 4-40 thd x 0.250 in. lg	ND21954	1
H-9		Washer, Spring: steel; OD 0.375 x ID 0.128 x 0.015 in. thick	156956	1
H-10		Stud, Switch Deck Mounting	150190	2
H-11		Stud, Trigger Spring	150154	1
L-1		Coil, Wound: 415 ohms; $\pm 15\%$	150191	1
M-1		Mechanism Assembly	179640-913	1
N-1	2	Scale (B)	156753	1
	3	Scale (B ₁)	156755	
	4	Scale (B ₂)	156757	
N-1	5	Scale (C)	156778	1
	6	Scale (C ₁)	156780	
	7	Scale (C ₂)	156782	
O-1		Bushing: brass; nickel pl; OD 0.281 x ID 0.140 x 0.180 in. thick	154311	1
O-2		Crank, Zero Corrector	150153	1
O-3		Spring, Trigger	150187	1
O-4		Trigger	150186	1
R-1	1	0 Ohms		
R-1	2	Resistor, Fixed: Carbon; 100 ohms; $\pm 10\%$; $\frac{1}{2}$ watt	27472	1
R-1	3	Resistor, Fixed: carbon; 150 ohms; $\pm 10\%$; $\frac{1}{2}$ watt		
R-1	4	Resistor, Fixed: carbon; 220 ohms; $\pm 10\%$; $\frac{1}{2}$ watt		
R-1	5	Resistor, Fixed: carbon; 360 ohms; $\pm 10\%$; $\frac{1}{2}$ watt		
R-2	1	Resistor, Fixed, Wire-Wound: 2600 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt	28092	1
R-2	2	Resistor, Fixed, Wire-Wound: 2750 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt		
R-2	3	Resistor, Fixed, Wire-Wound: 2900 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt		

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REPLACEMENT PARTS LIST FOR MODEL 749 (Con't)

Circuit Symbol	Code No.	Description	Weston Part No.	Quantity Per Inst.
R-2	1	Resistor, Fixed, Wire-Wound: 4380 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt	Deck D Select one as required	1
R-2	2	Resistor, Fixed, Wire-Wound: 4500 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt		
R-2	3	Resistor, Fixed, Wire-Wound: 4620 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt		
R-2	1	Resistor, Fixed, Wire-Wound: 5750 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt	Deck B Select one as required	1
R-2	2	Resistor, Fixed, Wire-Wound: 6100 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt		
R-2	3	Resistor, Fixed, Wire-Wound: 6450 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt		
R-3		Resistor, Fixed, Wire-Wound: 3299 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck B	NP	1
R-3		Resistor, Fixed, Wire-Wound: 3676.2 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck C	NP	1
R-3		Resistor, Fixed, Wire-Wound: 3428.0 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck D	NP	1
R-4		Resistor, Fixed, Wire-Wound: 901 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck B	NP	1
R-4		Resistor, Fixed, Wire-Wound: 708.4 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck C	NP	1
R-4		Resistor, Fixed, Wire-Wound: 841.0 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck D	NP	1
R-5		Resistor, Fixed, Wire-Wound: 353.9 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck B	NP	1
R-5		Resistor, Fixed, Wire-Wound: 256.9 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck C	NP	1
R-5		Resistor, Fixed, Wire-Wound: 316.8 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck D	NP	1
R-6		Resistor, Fixed, Wire-Wound: 183.7 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck B	NP	1
R-6		Resistor, Fixed, Wire-Wound: 130.1 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck C	NP	1

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REPLACEMENT PARTS LIST FOR MODEL 749 (Con't)

Circuit Symbol	Code No.	Description	Weston Part No.	Quantity Per Inst.
R-6		Resistor, Fixed, Wire-Wound: 164.4 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck D	NP	1
R-7		Resistor, Fixed, Wire-Wound: 56.9 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck B	NP	1
R-7		Resistor, Fixed, Wire-Wound: 40.0 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck C	NP	1
R-7		Resistor, Fixed, Wire-Wound: 50.7 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt; PO Deck D	NP	1
R-8	1	Resistor, Fixed, Wire-Wound: 54.0 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt	Deck B Select one as required	28068
R-8	2	Resistor, Fixed, Wire-Wound: 55.1 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt		
R-8	3	Resistor, Fixed, Wire-Wound: 56.2 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt		
R-8	1	Resistor, Fixed, Wire-Wound: 38.0 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt	Deck C Select one as required	28067
R-8	2	Resistor, Fixed, Wire-Wound: 38.4 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt		
R-8	3	Resistor, Fixed, Wire-Wound: 38.8 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt		
R-8	1	Resistor, Fixed, Wire-Wound: 48.5 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt	Deck D Select one as required	28090
R-8	2	Resistor, Fixed, Wire-Wound: 49.1 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt		
R-8	3	Resistor, Fixed, Wire-Wound: 49.7 ohms; $\pm \frac{1}{2}\%$; $\frac{1}{2}$ watt		
R-9		Resistor, Fixed: boron carbon; 228,800 ohms; $\pm 1\%$; $\frac{1}{2}$ watt; PO Deck B	NP	1
R-9		Resistor, Fixed: boron carbon; 216,000 ohms; $\pm 1\%$; $\frac{1}{2}$ watt; PO Deck C	NP	1
R-9		Resistor, Fixed: boron carbon; 223,400 ohms; $\pm 1\%$; $\frac{1}{2}$ watt; PO Deck D	NP	1
R-10		Resistor, Fixed: boron carbon; 114,400 ohms; $\pm 1\%$; $\frac{1}{2}$ watt; PO Deck B	NP	1

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REPLACEMENT PARTS LIST FOR MODEL 749 (Con't)

Circuit Symbol	Code No.	Description	Weston Part No.	Quantity Per Inst.
R-10		Resistor, Fixed: boron carbon; 108,000 ohms; $\pm 1\%$; $\frac{1}{2}$ watt; PO Deck C	NP	1
R-10		Resistor, Fixed: boron carbon; 111,700 ohms; $\pm 1\%$; $\frac{1}{2}$ watt; PO Deck D	NP	1
R-11		Resistor, Fixed: boron carbon; 114,400 ohms; $\pm 1\%$; $\frac{1}{2}$ watt; PO Deck B	NP	1
R-11		Resistor, Fixed: boron carbon; 108,000 ohms; $\pm 1\%$; $\frac{1}{2}$ watt; PO Deck C	NP	1
R-11		Resistor, Fixed: boron carbon; 111,700 ohms; $\pm 1\%$; $\frac{1}{2}$ watt; PO Deck D	NP	1
R-B		Resistor, Fixed: metal film: 449 ohms, $\pm 1\%$; $\frac{1}{8}$ watt, PO TB-2	NP	2
CR-1		Diode, Germanium		2
TB-1	2,3,4	Deck, Assembled: (Deck "B") consists of 8 permanent resistors R-3 to R-7 and R-9 to R-11	One deck per inst. 162477 162478 162488	
TB-1	5,6,7	Deck, Assembled: (Deck "C") same as Deck "B"		
TB-1	8,9,10	Deck, Assembled: (Deck "D") same as Deck "B"		
TB-2		Resistor Deck, Assembled: consists of two R-B resistors mounted on deck.		1

NP — NOT PROCURABLE. REPLACE COMPLETE DECK ASSEMBLY.

*Use jumper wire.

ACCESSORIES

CASE, Carrying	150918-001
PROBE TIPS (3)	151885-001
LEAD ASSEMBLY, Voltage	150897-901
ADAPTER, Plug-in Model 9886	159983-S

Instruction Card F-2601

MP MASTER



MA35441